

A REVIEW OF: “DOES THE SIMPLE DYNAMICAL SYSTEMS APPROACH PROVIDE USEFUL INFORMATION ABOUT CATCHMENT HYDROLOGICAL FUNCTIONING IN A MEDITERRANEAN CONTEXT? APPLICATION TO THE ARDÈCHE CATCHMENT (FRANCE)” BY M. ADAMOVIC ET AL, 2014

In this study the simple dynamical systems approach proposed by Kirchner (2009) is applied to a Mediterranean catchment: the Ardèche in France. Originally this method was used in two catchments in Wales, characterized by a wet climate. To explore if this approach also works in other climate zones, the authors of this paper used the Ardèche, characterized by strong summer dryness. The results show that the simple model works well for the wet periods, but fails to simulate the discharge well in dry, warm periods.

The paper overall is well written and well structured. It does not present new fundamental science; rather it applies a tried and tested model on a larger, more heterogeneous catchment in a drier, warmer climate, to provide a better understanding of the applicability of this model. It provides a thorough methodology, with fairly well presented results. The paper is definitely relevant for the hydrological community; the original paper (Kirchner, 2009) has presently been cited 111 times, but the concept was never tested in a drier catchment. However some things in this paper could be improved: there are some data quality issues that I feel could have been addressed better. I also think that the (physical) causes of the difference in model results, comparing the different sub-catchments, should be elaborated upon.

My recommendation to the editor is that this paper should be accepted, after proper revision of the mentioned issues.

MAJOR ISSUES

In this section I will describe in detail the two before mentioned major issues I found in the manuscript. Firstly I will discuss the data quality issues.

Most of the data quality issues come from the fact that the measurement quality in the Ardèche catchment is poor. Why did you use this catchment? The easiest way to circumvent the data quality issues was to have picked a well monitored research catchment with a similar climate like e.g. the Can Vila catchment in Spain (Latron and Gallart, 2008). That said, Braud et al (2014) improved the measurement network of several catchments (including the Ardèche!), providing continuous monitoring since 2010. You state that “the data set was not long enough to be used in the present study” (P10754 L23). However Melsen et al (2014) showed that only one season of data is needed to construct the parameters of the Kirchner method, so 4 years of high quality data seem more than sufficient. You also state that Krier et al (2012) “found that introducing a soil moisture threshold led to model improvements” (P 10728 L17/18). With data from Braud et al (2014) and the HyMeX project (Huza et al, 2014) this could have been implemented into the model. It is also mentioned several times that despite the data quality problems you still proceed to use the uncertain data, to get a rough assessment of the feasibility of the Kirchner model in a Mediterranean catchment. It would be nice to include a (rough) error analysis of the end results, to strengthen your conclusions.

My other major concerns were about the discussion of physical causes of the difference in model results. I think that these “predictors of hydrological variability” should be discussed more, and more thorough. Especially since you devoted a research question to the subject: “(2) What information about dominant predictors of hydrological variability can be retrieved from this analysis in such catchments?” (quoted from abstract). The discussion that you do give (section 5.3.2) is not that sound either. You give their granitic

lithology as reason for the better model performance of catchment #1 and #3, stating that “flow pathways are created in the many fractures, joints and fissures of the altered horizons” (P10757 L6/7). This is hardly unique for granite; in fact I would say that basalt has more fractures and joints, and thus more potential for flow paths. I would also say that perhaps the fact that catchment #1 and #3 are homogeneous is of more importance than the fact that they are granite catchments.

MINOR ISSUES

In this section I will describe the minor issues I found in the manuscript, which can be fixed without much work.

- P10734 L10: More explanation as to how the mass balances for catchments #2, #3 and #4 are “implausible” is required for us who are no expert on the evapotranspiration regime in the Ardèche. This is especially true for catchment #3, for which the actual evapotranspiration is in the same order of magnitude as the ET_0 obtained from SAFRAN. To say it is implausible without further comment is too brief. However, I must say that rescaling of the “implausible” data was cleverly done, and nicely validated in section 4.5.
- P10736 L4: After equation 4 the relevant parameters are described, including “ AET/ET_0 ” and “ P/ET_0 ”, but both of these terms are not present in equation 4.
- P10736 L11: Why do you value parameter w between 1.5 and 5? For those of us who are not familiar with F_u curves it seems like a big leap to narrow $[1 - \infty]$ down to $[1.5 - 5]$.
- I think the term “non-vegetation period” could be better, since you state that 27% of the land is occupied by coniferous forest (P10730 L23). This would mean that 27% of the land is green even in the “non-vegetation periods”. I suggest “low-vegetation period” or “non/low-evapotranspiration period” as alternative.
- P10749 L18: Why are only the results for catchment #1 presented? Was the manual sensitivity analysis not done for the other catchments? If it was done, and the results are the same, then I agree that presentation is not needed, but I feel that the fact that the results are the same (or not) does at least need to be mentioned.
- On page 10733 you state that you assume the following: $AET = PET = K_c * ET_0$. However, on page 10736, line 24/25, this is stated: “We also assume that [...] the mean $K_c * ET_0$ does not reflect the mean AET.” To me this seems contradictory.

SPECIFIC COMMENTS

Here I will point out things that can be easily fixed like typos or phrasing issues.

- P10739 L14: “nighttime (defined as a period between sunrise and sunset)” should be “nighttime (defined as a period between *sunset and sunrise*)”.
- P10748 L3: “The Borne at Nicolaud Bridge (#2) and Thines at Gournier Bridge (#3) catchments show good overall performance for the nine-year period with NSE = 0.67 and NSE log of 0.61 and NSE = 0.55 and NSE log of 0.78 respectively.” The last part of the sentence reads a bit awkward, you might consider rephrasing.
- I did not find a mention of figure 1 and figure 2 in the main text. It should not be too difficult to connect these figures to the text.
- Figure 3: Why are the three graphs presented separately? If all three lines were in the same graph (with the right format) they could be compared better in my opinion.

LITERATURE

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